Instruction Manual

Glow Tube Scaler

Model 131A

BAIRD-ATOMIC, INC.

33 UNIVERSITY ROAD, CAMBRIDGE, MASS. 02138

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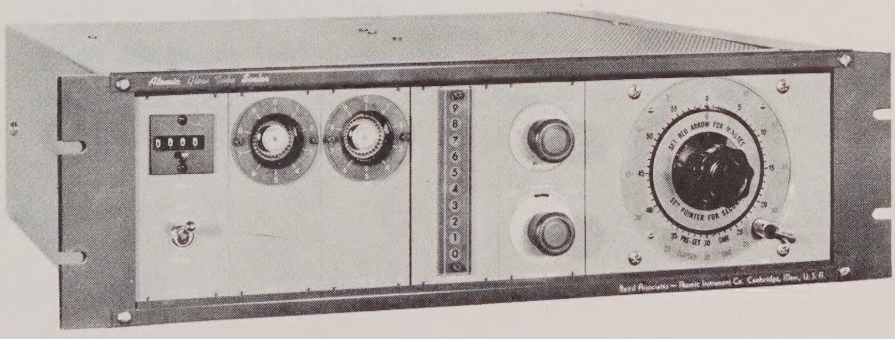

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MODEL 131A

I. GENERAL DESCRIPTION

The Model 131A is a scaler which can be used with all types of nuclear detectors. It is a low-heat, long-life scaler consisting of an input strip with an expander amplifier type of pulse height selector, a 5 μsec hard tube decade stage, two Dekatron scale-of-ten counting stages, a 4-digit electro-mechanical register, and a dual purpose timer (elapsed or preset time). It is self-contained with its own electronically regulated power supply and can provide some external power (as specified below).

Applications: With a Geiger tube the Model 131A requires an impedance transformer (eg., Baird-Atomic Model 231 Preamplifier with a gain of 1 as well as a separate high voltage supply).

For scintillation counting a preamplifier, linear amplifier, and, when desired, a pulse height analyzer are required. The scaler may also be used directly with scintillation detectors containing a built-in amplifier such as Baird-Atomic's Model 810B Bench-type Well Scintillation Detector. As in Geiger counting, a separate high voltage supply is required for scintillation work.

SPECIFICATIONS

Count Capacity: 7 decade, 9,999,999 count capacity

Resolving Time: Faster than 5 μsec

Input Sensitivity: 0.25v min, negative only

Input Impedance: 1,500 ohms

Pulse Height Selector (Range and Polarity): Adjustable stable discriminator calibrated at the input from 0.25v to 10v, negative only

Controls: POWER On-off

RESET Resets register and all scaling stages from a single switch

MODE SWITCH 60-cycle test, count, clock

TIMER Dual purpose precision timer controls preset time intervals or indicates elapsed time; calibrated in minutes and seconds up to 1 hour; accuracy $\pm$ 0.1 second.

Receptacles: Signal Input BNC(JK-36)

Preamplifier Power and Signal Input AN3102-16S-1S(JK-31)

Discriminator Output: BNC (JK-36)

External Power: +250v DC at 40 ma

−150v DC at 5 ma

6.3v AC at 2 amps

*Input Power: 115v AC, 60 cycles, at 1.3 amps

Dimensions: 19″ w x 5¼″ h x 17″ d

Net Weight: 30 lbs.

Shipping Weight: 45 lbs.

*(115v, 50 cycles or 220v, 50 cycles also available)

II. INSTALLATION

Location. The equipment is self-contained. It may either be used in its own cabinet placed on a bench or table, or it may be removed and mounted in a relay rack. Since no side access is required, it can be placed next to a wall or between other units. There should be a back clearance behind the equipment sufficient to make connections and provide adequate ventilation.

The Model 131A General Purpose Scaler has three connectors and a power cord which are located on the rear of the chassis. J101 is an AN type providing B+, filament, signal and ground connections for an external preamplifier. J102 is a BNC type chassis connector wired in parallel with the signal lead in the AN connector; it may be used as a separate signal input from amplifiers, pulse height analyzers, etc. J103 connector is a BNC type JK chassis connector which provides an output connection from the Model 988A discriminator.

III. OPERATION

SEQUENCE FOR PUTTING THE MODEL 131A INTO OPERATION:

(Note: Make sure power switch is OFF before connecting to AC line.)

a. Set the operation control in the TEST position. Set the pulse height selector control at 0.25 volt. This position is indexed in red on the knob skirt.

b. Put the power switch on the Model 1283 Register Strip in the ON position. After a short warm-up time, orange glows will appear on the front of the decade scaling strip and in the two Dekatron counting tubes. These glows may come on indicating any number.

c. Depress the reset switch on the register. This will return all of the scaling strips as well as the mechanical register to zero.

d. Set the large black hand on the clock to one minute. This can be done by rotating the knob clockwise one unit (equals one click). Set the second hand at zero.

e. With the clock set at one minute, depress the clock switch to the ON position. This will direct pulses at a 60 cycle rate into the counter. This procedure is known as "60 cycle test." If the instrument is operating correctly, at the end of one minute the scaler will indicate 3600 counts $\pm$ a few counts (allowing for clock tolerance).

NOTE: On 60 cycle: 60 CPS times 60 seconds = 3600 CPM

On 50 cycle: 50 CPS times 60 seconds = 3000 CPM

The 60 cycle test signal will operate with the PHS knob *at not more than about 1 volt.*

The pulse height selector knob on the front of the Model 988A Input Strip is calibrated at the scaler input from negative 0.25 volts to negative 10 volts. By the use of the Pulse Height Selector, unwanted low level pulses from various detectors may be rejected; that is, the Model 131A Scaler will accept only pulses of an amplitude above that set by the Pulse Height Selector. It may also be used for integral pulse height analysis with such B/A Scintillation Probes as the Model 810B, 812B, 815B, and 818B.

The Model 685 Timer may be used as either a preset timer or elapsed timer. By setting the black hand on the black numbers the timer is used as a preset timer. By rotating the black hand 360° clockwise and noting the red indications the timer can be used to record elapsed time.

When the operation control switch is in the TEST position only the 60 cycle test signal will be counted with ON-OFF controlled by the timer lever. When the control switch is in the TIMER or CLOCK position, the scaler counting is also controlled by the timer. In the COUNT position, the scaler will count incoming pulses until it is stopped manually by turning the operational control switch to the TIMER position (with timer lever in the OFF position).

IV. THEORY OF OPERATION

This section discusses the theory of operation of each unit in the Model 131A Scaler with the amount of detail depending on the uniqueness of the design features.

Model 988A Input Strip. V101 A and B are connected as an amplifier, the gain of which is held constant by negative feedback through R105. Since the cathode of V101B and the grid of V103 are tied together, varying the bias on the grid of V101B by means of R113 (PHS) will determine the voltage on the grid of V103. Note that the cathode of V103 is held at +85 V by the VR tube, V102. Therefore a signal on the grid of V103 must exceed the difference between the grid and cathode of V103 in order to cause conduction of V103. The expander amplifier, V103, sends a negative signal to the Schmitt circuit, V104 A and B, the left-hand portion of which is normally conducting and the right-hand, cut-off. If the signal is sufficiently large (approximately four volts), it will cut off V104A, and the grid and cathode of V104B will move in opposite directions. This will cause V104B to conduct until the signal on the grid goes sufficiently positive to start conduction of V104A. At this point the cathode voltage of V104B rises, the plate voltage decreases, the voltage at the grid decreases, and V104B cuts off. Hence the output of the 988A Strip is negative square pulses.

Note that the clock can stop operation of the scaler by lowering the voltage on the quadrature grid of V103 (pin 6) when the selected amount of time has elapsed.

Model 184 Decade Scaling strip. This unit consists of four cascaded binary scaling pairs. Triggering of the binary scaling pair forming the input stage of the four cascaded stages is effected through two triggering diodes (V101). Each of the four binary scaling pairs consists of two resistance-coupled triode amplifiers having DC intercoupling to provide a circuit which exhibits two stable states of equilibrium. The circuit constants are such that when one triode is conducting, the grid of the other triode is held below cutoff by the DC coupling between the two sections. Conversely, the grid of the conducting triode is held firmly on by the plate circuit of the non-conducting triode. Thus, the circuit will remain in this condition of equilibrium until an external trigger causes it to flip over to its other equilibrium state. It will readily be seen that four such binary scaling pairs cascaded will produce one output pulse for every sixteen input pulses. However, by means of appropriate coupling connections and a feedback loop, the system is caused to reset to its zero count position after each tenth count. To provide a direct system of indication utilizing 10 neon lamps numbered from 0 to 9 consecutively, it is necessary to translate the applied input pulse to a voltage which lights only the appropriate lamp. This is accomplished by utilizing the plate potentials of all eight triodes of the decade in such a manner as to provide a unique voltage condition corresponding to the particular pulse applied. (See Table I for detail of states of conduction.)

Model 180 Scaling Strips. The next two scaling stages utilize the Dekatron cold cathode tube for scaling as well as visual representation of the count. These tubes have a visible cathode glow on one of a set of interconnected cathodes, arranged around a central common anode. This glow moves from one position to the next and sends an output pulse on the appearance of every tenth pulse. The voltages by which the transfer of the pulse is effected are derived from V101, a double triode, both halves of which are biased to cut-off. A positive-going pulse from the previous scaling stage applied to the grid of V101A produces a negative rectangular pulse at V101A plate which is coupled to guide electrode #1 (pin 3). The glow moves from the cathode to the guide electrode since the discharge can more easily take place with the higher potential difference that now exists between guide electrode and anode. At the end of the input pulse, V101A plate potential rises; this causes V101B to conduct and so produce a negative pulse for guide electrode #2 (pin 5). Since the voltage has just been removed from guide 1, the glow now moves to guide 2. At the end of this pulse, the discharge takes place between the nearest cathode and the anode. Thus it may be seen that the glow jumps one unit for each pulse input to the drive circuit of the glow tube.

Two of these circuits are cascaded so that along with the 184 strip, the three scaling strips produce one output pulse to the drive circuit of the electro-mechanical register for every 1000 input pulses.

Model 1283 Drive Circuit. A positive pulse from the last scaling strip fires V102, a gas tube normally off, and this sends current through the register for a period of time dependent on associated circuitry. The negative pulse at the plate of V102 is coupled to both the grid and plate of V101, cutting it off. C101 and C102 charge toward B+ until they are high enough to trigger V101 and cut off V102. This provides a pulse for the register which is precise and independent of the input waveform.

Model 381B Power Supply. After full-wave rectification by V101 and filtering by C101, C103, and L101, the +450 volts is fed to the glow tubes and to a voltage regulator circuit. The twin-triode (V103) is a series regulator which acts in opposition to the amplified fluctuations sent to the grids from V104. This produces a regulated +250 and +150 volts. The negative voltages are provided by half-wave rectification by V102; filtered, this gives −160 V as well as a −150 V regulated by a VR tube (V105).

Count	V102A	V102B	V103A	V103B	V104A	V104B	V105A	V105B
0	O	X	O	X	O	X	O	X
1	X	O	O	X	O	X	O	X
2	O	X	X	O	O	X	O	X
3	X	O	X	O	O	X	O	X
4	O	X	O	X	X	O	O	X
5	X	O	O	X	X	O	O	X
6	O	X	X	O	O	X	X	O
7	X	O	X	O	O	X	X	O
8	O	X	O	X	X	O	X	O
9	X	O	O	X	X	O	X	O
10 (0)	O	X	O	X	O	X	O	X

TABLE I.

Table showing conducting tubes marked "X" and non-conducting tubes marked "O" for each count position of the decade scaling strip circuit.

VOLTAGE READINGS

M. 988A Strip Measured with P.H.S. at approximately ".25"

Pin No. Tube	1	2	3	4	5	6	7	8	9	Tube Type
V101	250	78	82	6.3 A.C.	6.3 A.C.	138	0	.9	0	6201
V102	86	0	—	0	86	—	0	—	—	85A2
V103	86	82	0	6.3 A.C.	163	88	163	—	—	6BN6
V104	220	90	96	6.3 A.C.	6.3 A.C.	250	80	96	—	5965

M. 184 Strip (Readings at Reset Condition)

Pin No. Tube	1	2	3	4	5	6	7	8	9	
V101	178	178	0	6.3 A.C.	178	—	95	—	—	6AL5
V102	178	10	58	0	0	95	58	58	6.3 A.C.	12AU7
V103	197	10	58	0	0	85	58	58	6.3 A.C.	12AU7
V104	197	10	58	0	0	85	58	58	6.3 A.C.	12AU7
V105	197	10	58	0	0	85	58	58	6.3 A.C.	12AU7

M. 180 Strips (Voltage Reading at Reset Condition)

Pins Tubes	1	2	3	4	5	6	7	8	9
V101 (12AX7)	67	−150	−150	−150	−150	70	−150	−150	−150
V102 (GC10B)	1.4	1.4	68	230	64	1.4	45	1.4	—

M. 1283 Strip

Tubes Pins	1	2	3	4	5	6	7	Tube Type
V101	0	0	6.3 A.C.	0	0	12.5	0	5696
V102	−10	0	6.3 A.C.	0	0	250	0	5696

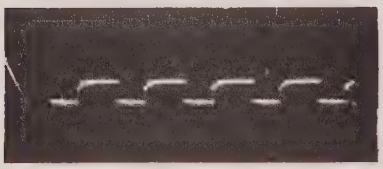
M381B (Power Supply)

Pin No. Tubes	1	2	3	4	5	6	7	8	Tube Type
V101	—	540	—	400 A.C.	—	400 A.C.	—	540	5V4
V102	−380	—	*	*	—	96	400 A.C.	—	6X4
V103	110	490	250	110	490	250	6.3 A.C.	0	6080
V104	−.5	0	0	6.3 A.C.	112	96	0	—	6BH6
V105	0	−150	—	−150	0	—	−150	—	6626

*6.3 A.C. between pins 3 and 4

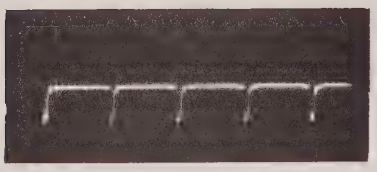
1. Input pulse (5 kc)
   20μs/div.
   1v/div.

2. Output of 988A
   10μs/div.
   50v/div.



3. Output of 184
   1ms/div.
   50v/div.

4. Pulse at 1st Guide in M. 180
   1ms/div.
   100v/div.



5. Pulse at 2nd Guide in M. 180
   1ms/div.
   100v/div.

6. Output from 180
   1ms/div.
   50v/div.

7. Output from 180
   10ms/div.
   50v/div.

TABLE III. WAVE FORMS

PARTS LIST FOR MODEL 131A

MODEL 988A

Part No.	Description	B/A No.
C101	CAPACITOR, 0.01μf, ceramic, 10%, 500v	00020
C102	CAPACITOR, 27μμf, ceramic, 10%, 500v	00039
C103 thru C106	Same as C101	
C107	CAPACITOR, 0.1μf, paper, 10%, 200v	00583
C108	Same as C101	
C109	CAPACITOR, 56μμf, ceramic, 10%, 500v	00076
C110	CAPACITOR, 0.22μf, mylar, 10%, 200v	00678
C111	Same as C101	
R101	RESISTOR, 1 meg, 1/2w, 5%, comp.	00263
R102	RESISTOR, 4.7K, 1/2w, 1%, metallized film	
R103	RESISTOR, 27K, 2w, 5%, comp.	01034
R104	RESISTOR, 200 ohm, 1/2w, 5%, comp.	00068
R105	RESISTOR, 51K, 1/2w, 1%, metallized film	
R106	RESISTOR, 51K, 1/2w, 5%, comp.	00334
R107	RESISTOR, 30K, 2w, 5%, comp.	00347
R108	RESISTOR, 220K, 1/2w, 5%, comp.	00303
R109	RESISTOR, 8.2K, 2w, 5%, comp.	01099
R110	RESISTOR, 24K, 1/2w, 5%, comp.	00350
R111	RESISTOR, 2K, 2w, variable wirewound	01087
R112	RESISTOR, 1.5K, 1/2w, 1%, comp.	00113
R113	RESISTOR, 50K, 2w, variable wirewound	
R114	RESISTOR, 10K, 1/2w, 5%, comp.	00368
R115	RESISTOR, 1.5 meg, 1/2w, 5%, comp.	00256
R116	RESISTOR, 200K, 1/2w, 5%, comp.	00305
R117	RESISTOR, 1 meg, 1/2w, 5%, comp.	00263
R118	RESISTOR, 300K, 1/2w, 5%, comp.	00296

PARTS LIST FOR MODEL 131A (Cont.)

MODEL 988A

Part No.	Description	B/A No.
R119	RESISTOR, 6.2K, 1/2w, 5%, comp.	00380
R120	RESISTOR, 510K, 1/2w, 5%, comp.	00286
R121	RESISTOR, 2.7K, 1/2w, 5%, comp.	00147
R122	RESISTOR, 5.1K, 1/2w, 5%, comp.	00385
R123	RESISTOR, 12K, 2w, 5%, comp.	01125
R124	RESISTOR, 7.5K, 1/2w, 5%, comp.	00376
R125	RESISTOR, 68K, 1/2w, 5%, comp.	
R126	RESISTOR, 120K, 1w, 5%, comp.	01075
R127	RESISTOR, 510 ohm, 1/2w, 5%, comp.	00092
S101	SWITCH, wafer	01288
V101	TUBE, 6201	01674
V102	TUBE, 85A2	01488
V103	TUBE, 6BN6	01385
V104	TUBE, 5965	01524

MODEL 184

C101	CAPACITOR, 100μμf, ceramic, 5%, 500v	00006
C102	CAPACITOR, 47μμf, ceramic, 5%, 500v	00064
C103	CAPACITOR, 0.01μμf, ceramic, 5%, 500v	00020
C104	Same as C102	
C105	CAPACITOR, 22μμf, ceramic, 5%, 500v	00038
C106	Same as C102	
C107	Same as C105	
C108	Same as C105	
C109	Same as C102	
C110	Same as C105	
C111	Same as C102	

PARTS LIST FOR MODEL 131A (Cont.)

MODEL 184

Part No.	Description	B/A No.
C112	CAPACITOR, 27μμf, ceramic, 5%, 500v	00039
C113	Same as C102	
C114	Same as C102	
C115	Same as C105	
C116	Same as C105	
C117	Same as C102	
C118	Same as C103	
I101 thru I110	INDICATOR LAMP, NE-2	
R101	RESISTOR, 680K, 1/2w, 5%, comp.	00278
R102	RESISTOR, 100K, 1/2w, 5%, comp.	00319
R103	RESISTOR, 330K, 1/2w, 5%, comp.	00294
R104	Same as R102	
R105	Same as R103	
R106	RESISTOR, 150K, 1/2w, 5%, comp.	00311
R107	RESISTOR, 82K, 1/2w, 5%, comp.	00323
R108	RESISTOR, 39K, 1w, 5%, comp.	00340
R109	RESISTOR, 4.3K, 2w, 5%, comp.	07886
R110	RESISTOR, 24K, 1w, 5%, comp.	00350
R111	RESISTOR, 15K, 1/2w, 5%, comp.	00362
R112	Same as R106	
R113	Same as R107	
R114	RESISTOR, 47K, 1/2w, 5%, comp.	00337
R115	RESISTOR, 220K, 1/2w, 5%, comp.	00303
R116	Same as R115	
R117	RESISTOR, 120K, 1/2w, 5%, comp.	00315
R118	Same as R114	
R119	Same as R110	

PARTS LIST FOR MODEL 131A (Cont.)

MODEL 184

Part No.	Description	B/A No.
R120	Same as R110	
R121	Same as R115	
R122	Same as R115	
R123	Same as R117	
R124 thru R126	Same as R115	
R127	Same as R117	
R128	Same as R114	
R129	Same as R110	
R130	Same as R110	
R131	Same as R115	
R132	Same as R115	
R133	Same as R117	
R134 thru R137	Same as R115	
R138	Same as R117	
R139	RESISTOR, 33K, 1w, 5%, comp.	00345
R140	Same as R111	
R141	Same as R111	
R142	Same as R115	
R143	Same as R115	
R144	Same as R117	
R145	Same as R115	
R146	RESISTOR, 270 ohm, 1w, 5%, comp.	00074
R147	Same as R139	
R148	RESISTOR, 390K, 1/2w, 5%, comp.	00290
R149	Same as R106	
P101	CONNECTOR, male, 16-pin assem. to A11809 plate	00746

PARTS LIST FOR MODEL 131A (Cont.)

MODEL 184

Part No.	Description	B/A No.
V101	TUBE, 6AL5	01338
V102 thru V105	TUBE, 12AU7	01468
CR101	DIODE, germanium, S151G	

MODEL 180

(Note for spare parts supply that two units of this scaling strip are required for the 131A)

C101	CAPACITOR, 680μμf, ceramic, 10%, 500v	00083
C102	CAPACITOR, 100μμf, ceramic, 5%, 500v	00006
C103	Same as C102	
P101	CONNECTOR, male, 16-pin	
R101	RESISTOR, 220K, 1/2w, 5%, comp.	00303
R102	Same as R101	
R103	RESISTOR, 3.6 meg, 1/2w, 5%, comp.	00220
R104	RESISTOR, 7.5 meg, 1/2w, 5%, comp.	00197
R105	Same as R101	
R106	RESISTOR, 510K, 1/2w, 5%, comp.	00286
R107	RESISTOR, 1 meg, 1/2w, 5%, comp.	00263
R108	RESISTOR, 560K, 1/2w, 5%, comp.	00284
R109	RESISTOR, 100K, 1/2w, 5%, comp.	00319
R110	RESISTOR, 68K, 1/2w, 5%, comp.	00326
V101	TUBE, 12AX7	01478
V102	TUBE, GC10B	01484

MODEL 1283

C101	CAPACITOR, 0.1μf, paper tubular, 600v, 5%	00591
C102	CAPACITOR, 0.04μf, ceramic, 500vdc	00497
C103	CAPACITOR, 220μμf, ceramic, 5%, 500v	00038

PARTS LIST FOR MODEL 131A (Cont.)

MODEL 1283

Part No.	Description	B/A No.
R101	RESISTOR, 68K, 1w, 5%, comp.	00326
R102	RESISTOR, 1.5 meg, 1/2w, 5%, comp.	00256
R103	RESISTOR, 10K, 1w, 5%, comp.	02719
R104	RESISTOR, 22 meg, 1/2w, 5%, comp.	00166
R105	RESISTOR, 1.8 meg, 1/2w, 5%, comp.	00249
R106	RESISTOR, 470K, 1/2w, 5%, comp.	00288
P101	CONNECTOR, male, 16-pin	00732
I101	REGISTER, 4-digit	00568
V101	TUBE, 5696	07724
V102	Same as V101	

MODEL 381B

C101 thru C103	CAPACITOR, 4μf, oil, 600vdc	00708
C104	CAPACITOR, 8μf, electrolytic, 350vdc	00578
C105	CAPACITOR, 12μf, electrolytic, 250vdc	00565
C106A&B	CAPACITOR, 45μf, electrolytic, 400vdc	00562
C107	CAPACITOR, 0.22μf, mylar, 600vdc	00684
F101	FUSE, 2 amp., Slo-Blo	00312
J107	CONNECTOR, female, 12-pin	00706
L101	CHOKE, 7 hy, 125ma, 300 ohms	01053
P101	PLUG AND LINECORD #18, 6-foot	
R101	RESISTOR, 6K, 5w, wirewound	01208
R102	RESISTOR, 2K, 2w, 5%, comp.	01035
R103	RESISTOR, 510 ohm, 1/2w, 5%, comp.	00092
R104	RESISTOR, 100 ohm, 1/2w, 5%, comp.	00058
R105	RESISTOR, 10K, 1/2w, 5%, comp.	00368

PARTS LIST FOR MODEL 131A (Cont.)

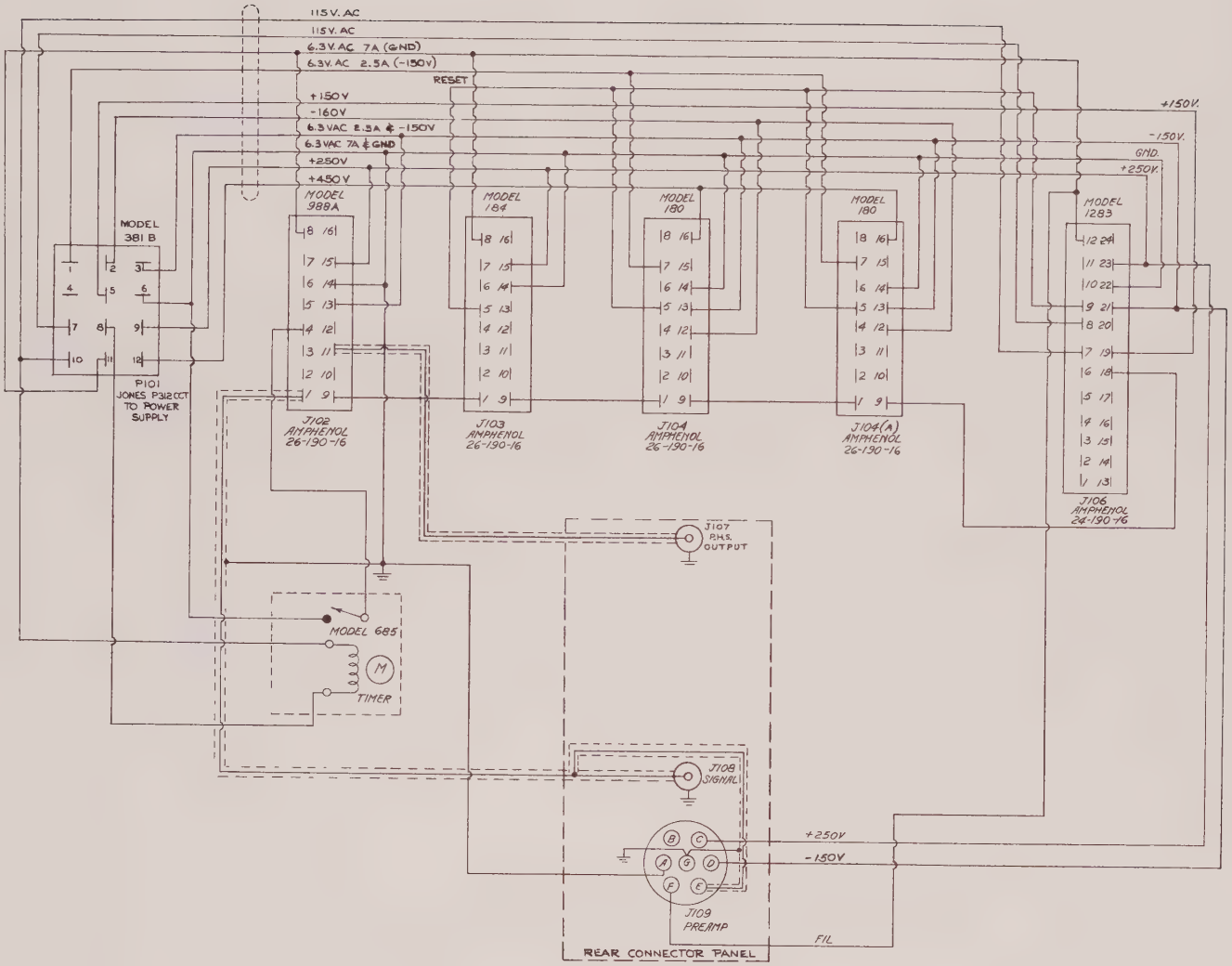
MODEL 381B

Part No.	Description	B/A No.
R106	RESISTOR, 47 ohm, 1/2w, 5%, comp.	00035
R107	Same as R106	
R108	Same as R105	
R109	RESISTOR, 130K, 2w, 5%, comp.	00313
R110	RESISTOR, 75K, 1w, 5%, comp.	00324
R111	RESISTOR, 33K, 1w, 5%, comp.	00345
R112	Same as R105	
R113	RESISTOR, 15K, 2w, 5%, comp.	00362
R114	RESISTOR, 270K, 1/2w, 5%, comp.	00298
R115	RESISTOR, 50K, potentiometer, 2w, 5%	01351
R116	RESISTOR, 160K, 1/2w, 5%, comp.	00309
R117	RESISTOR, 2K, 5w, 5%, comp.	01035
T101	TRANSFORMER, power, 800v, ct at 150ma dc; 5.0v at 2a; 6.3v at 1a; 6.3v at 2.5a; 6.3v at 7a	01520
V101	TUBE, 5V4	01305
V102	TUBE, 6X4	01435
V103	TUBE, 6080	01530
V104	TUBE, 6BH6	01380
V105	TUBE, 6626	01701

MODEL 685

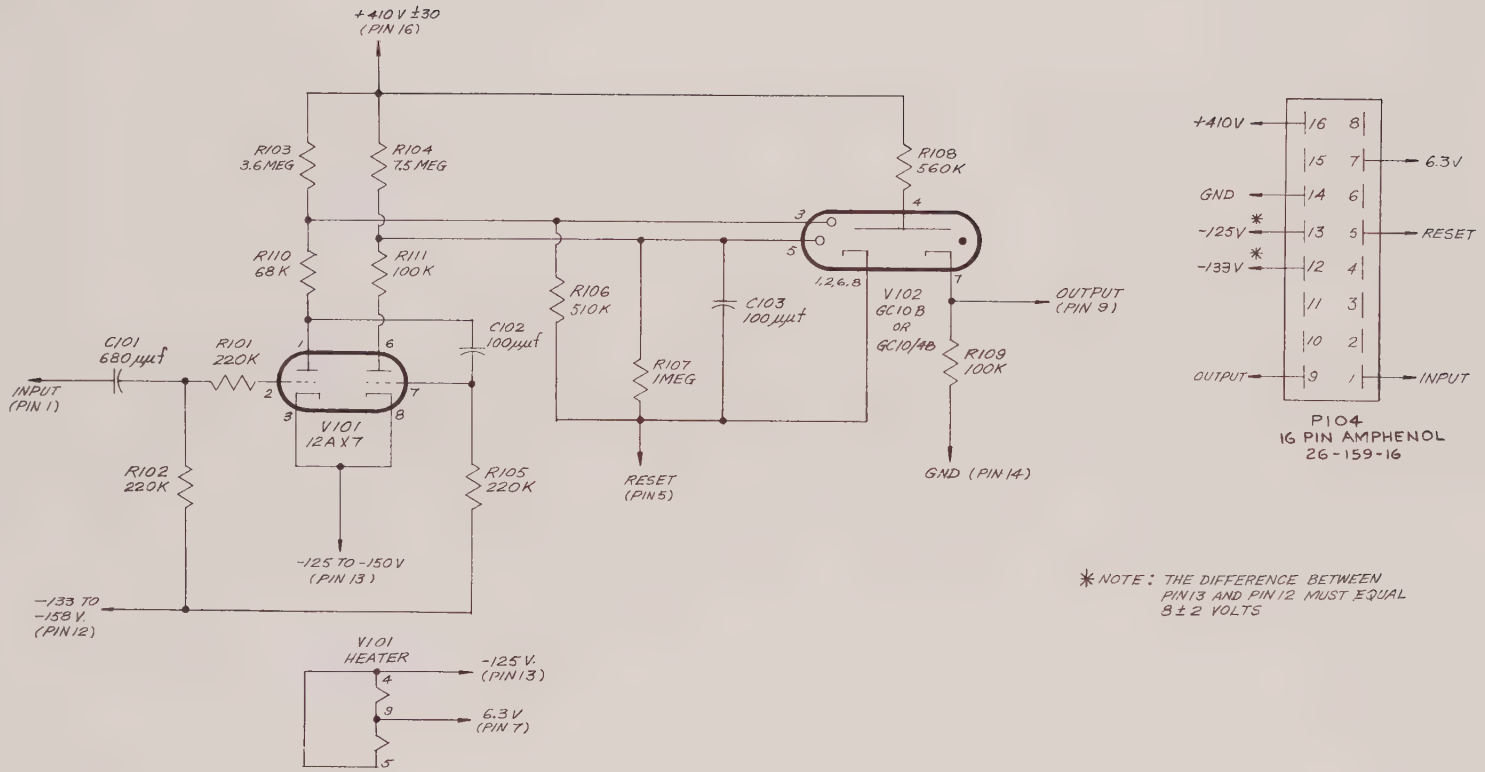
	TIMER, preset and elapsed, 0 to 60 min., 110v, 60 cps	00408

SCHEMATICS



INTERCONNECTION WIRING DIAGRAM
FOR MODEL 131A SCALER

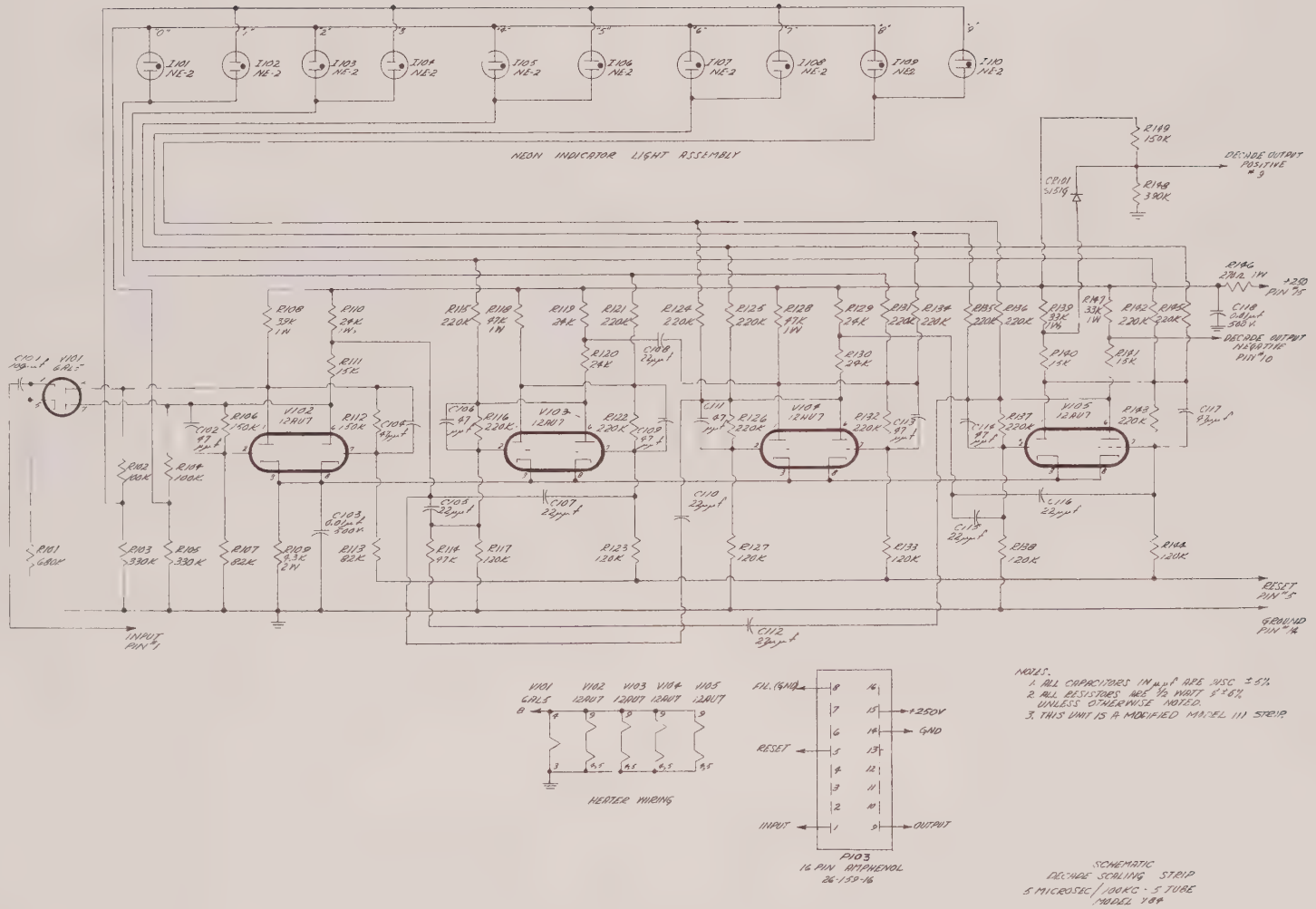
C- 09389 J



✱ NOTE: THE DIFFERENCE BETWEEN PIN 13 AND PIN 12 MUST EQUAL 8 ± 2 VOLTS

SCHEMATIC
UNIT DECADE PLUG IN SERIES
MODEL 180

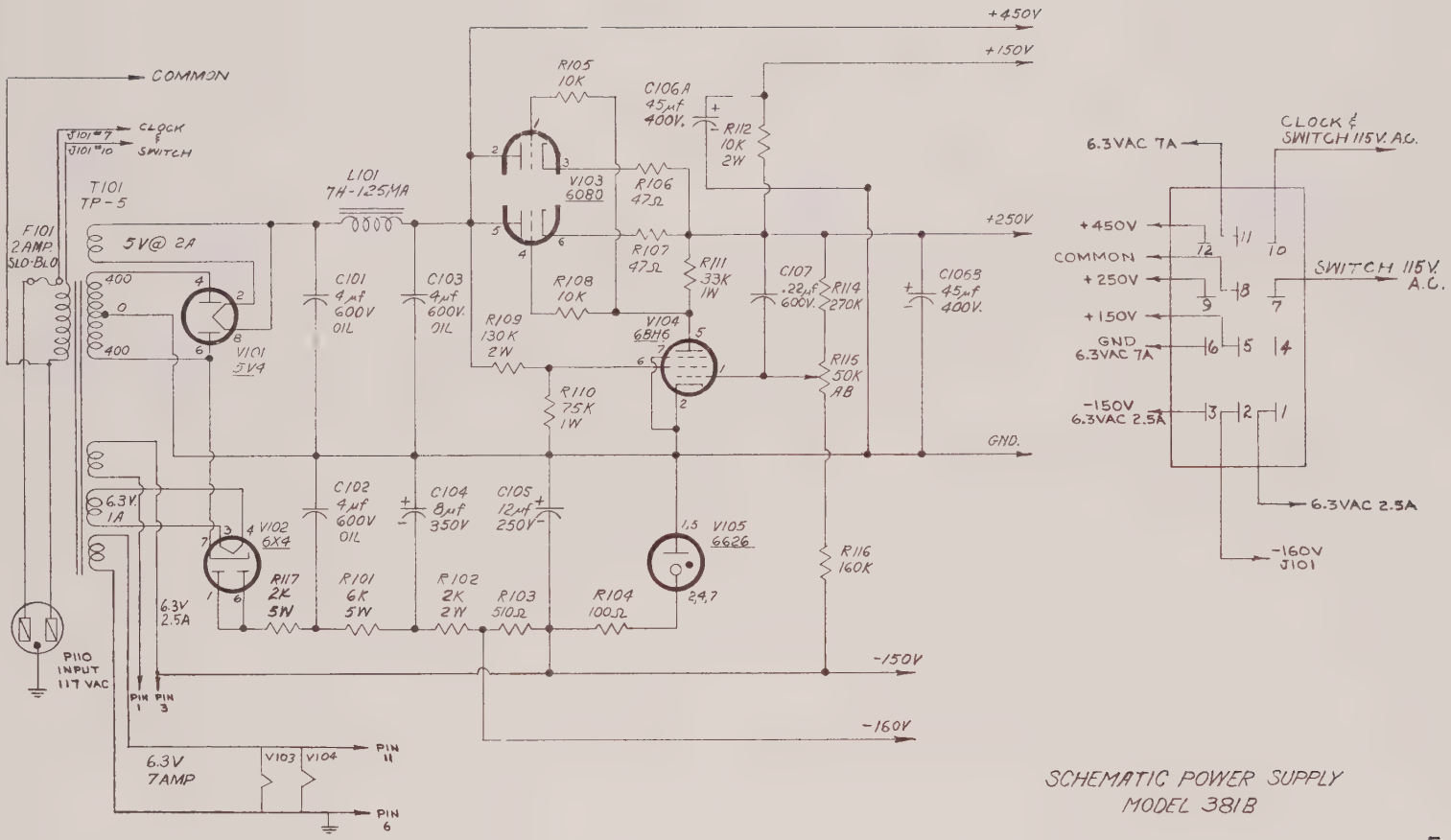
B-09391 T



NOTES.
1. ALL CAPACITORS IN μμf ARE MYSC ± 5%
2. ALL RESISTORS ARE ½ WATT 5% ± 5%
UNLESS OTHERWISE NOTED.
3. THIS UNIT IS A MODIFIED MODEL 111 STRIP

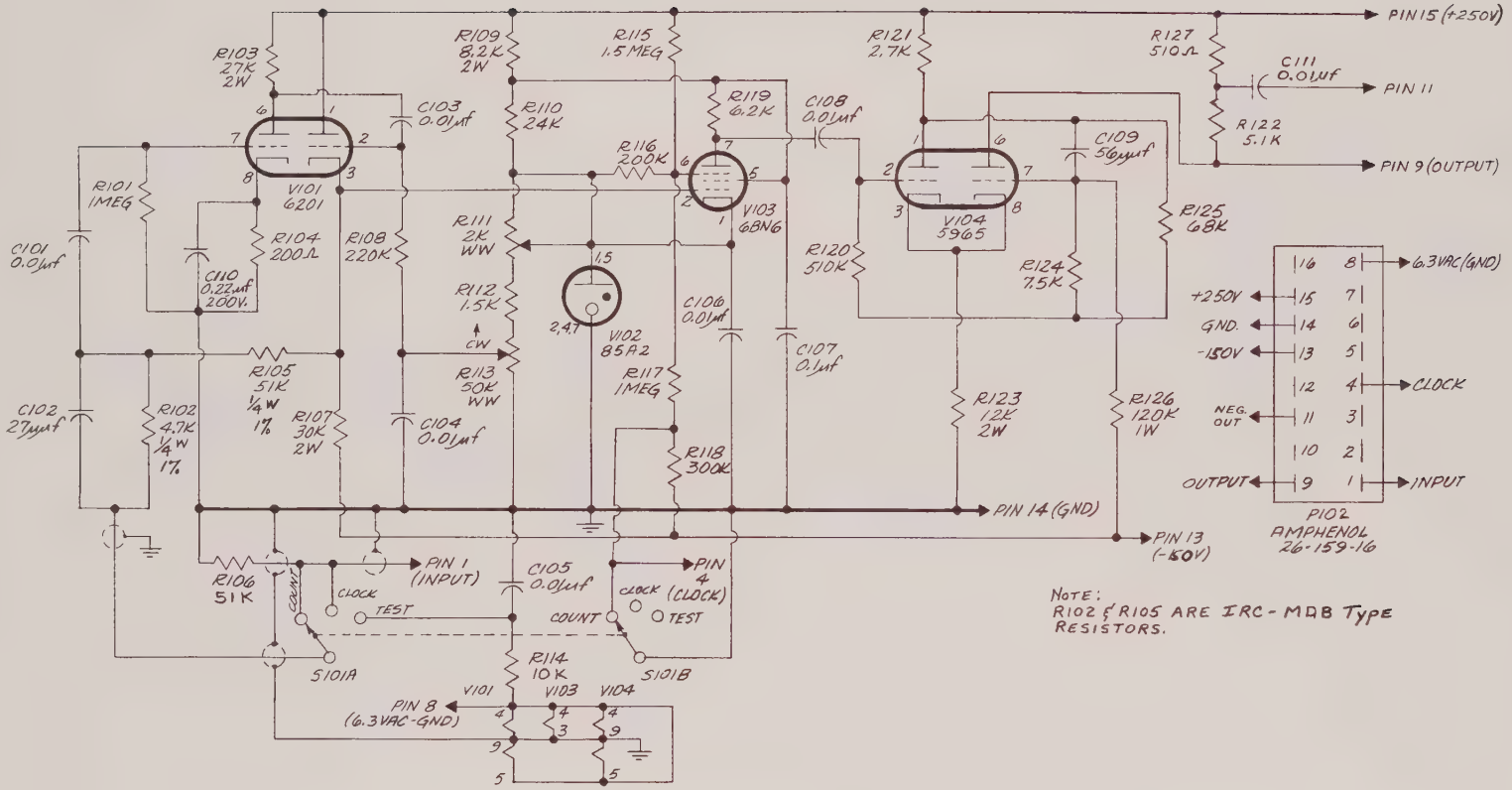
SCHEMATIC
DECADE SCALING STRIP
5 MICROSEC / 100 KC · 5 TUBE
MODEL Y84

C- 09393 E



SCHEMATIC POWER SUPPLY
MODEL 381B

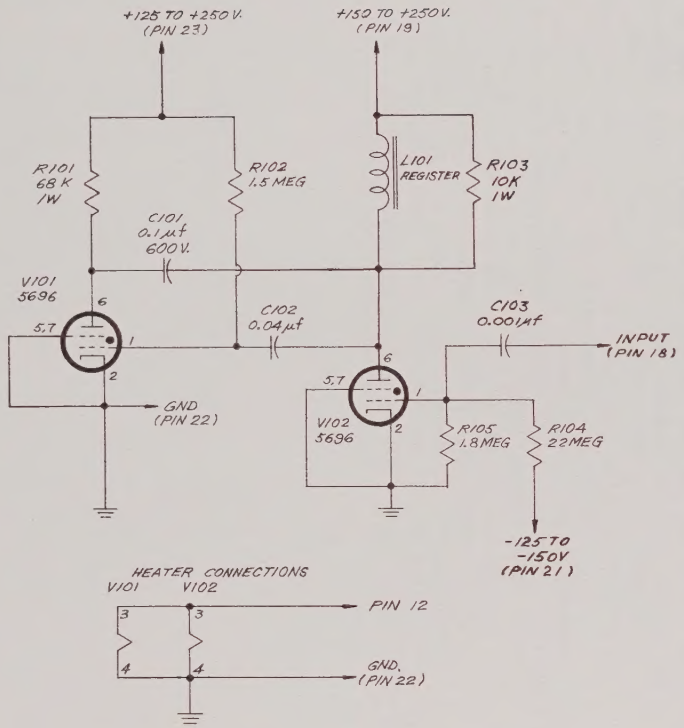
B- 09394 F

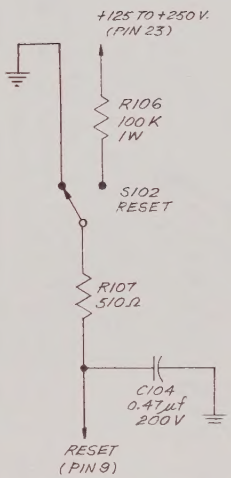


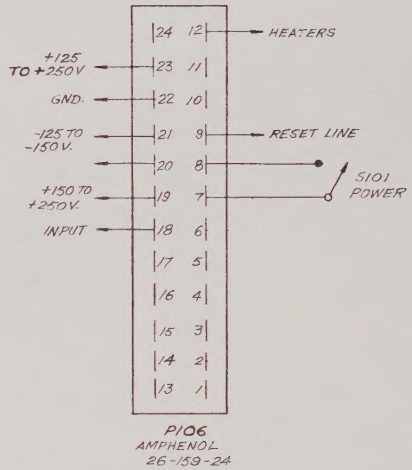
NOTE:
R102 & R105 ARE IRC - MOB Type RESISTORS.

SCHEMATIC
PRE-EXPANDING AMPLIFIER
MODEL 988A

B- 09395 F







SCHEMATIC
UNIT REGISTER
MODEL 1283

B-09396

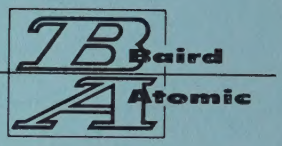
P

Warranty

Baird-Atomic, Inc. (the "Company"), warrants this equipment for a period of 1 year from the date of shipment as follows: it warrants that all equipment of its manufacture is free from defects in material and workmanship at the time of shipment. If within 1 year of shipment any equipment of the Company's manufacture develops defects in material or workmanship under normal conditions of operation, the buyer of the equipment may return it to the Company within 30 days of such failure, for repairs at the expense of the Company excluding transportation costs, or in the case of any defective part may return such part to the Company which will repair or replace the same at its expense excluding transportation costs. A further warranty of 1 year on the same terms shall be applicable to any part so repaired or replaced. Except for Dekatron glow tubes, this warranty does not extend to stock components not manufactured by the Company.

The Company shall not be liable for damage or destruction of instruments during delivery or caused by other than employees of Baird-Atomic, Inc.; in any event, liability shall not exceed the cost of replacement of defective parts upon prompt notification of such defect. For return of equipment or any part thereof under the terms of the foregoing warranty a letter should be forwarded to Baird-Atomic, Inc., Attention: Sales Service Department, 33 University Road, Cambridge 38, Massachusetts. It should state owner's name and address; model and serial number of equipment; the order number under which it was purchased; the date of failure and a description of the circumstances surrounding same. Upon receipt of such information, shipping instructions for return of equipment or parts thereof will be forwarded promptly.

Baird-Atomic, Inc.
33 UNIVERSITY RD., CAMBRIDGE 38, MASS.



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